

Claims

- [c1] An ultrasonic dental insert useful in a handpiece having an induction coil disposed about a well and operable with an adjustable power supply having a maximum power output setting, comprising:
- an efficiency-modulated magnetostrictive element adapted to be received in the well;
 - a velocity transducer having proximal and distal ends, wherein the proximal end is attached to a distal end of the magnetostrictive element;
 - a power-sensitive tip having a proximal end secured to the distal end of the velocity transducer;
- wherein the efficiency of the magnetostrictive element is matched with the power sensitivity of the tip to prevent overpowering the tip at the maximum power output setting.
- [c2] The ultrasonic dental insert of claim 1, wherein the magnetostrictive element has an efficiency rating less than 50 percent.
- [c3] The ultrasonic dental insert of claim 2, wherein the magnetostrictive element comprises nickel.
- [c4] The ultrasonic dental insert of claim 2, wherein the magnetostrictive element comprises a plurality of coextensive longitudinally oriented nickel or nickel alloy wires.
- [c5] The ultrasonic dental insert of claim 4, wherein the wires are welded at a distal end thereof inside a ring secured to the proximal end of the velocity transducer.
- [c6] The ultrasonic dental insert of claim 4, wherein the wires have a uniform cross section.
- [c7] The ultrasonic dental insert of claim 4, wherein the wires have a non-uniform cross section.
- [c8] The ultrasonic dental insert of claim 4, wherein the magnetostrictive element includes one or more non-magnetostrictive wires.

- [c9] The ultrasonic dental insert of claim 4, wherein the magnetostrictive element includes one or more magnetostrictive-dampening wires.
- [c10] The ultrasonic dental insert of claim 4, wherein the wires are stiffened by axially spaced containment rings.
- [c11] The ultrasonic dental insert of claim 10, further comprising a proximal end cap receiving a proximal end of the wires.
- [c12] The ultrasonic dental insert of claim 4, further comprising a containment wire wound around the longitudinal wires.
- [c13] The ultrasonic dental insert of claim 2, wherein the magnetostrictive element includes void space.
- [c14] The ultrasonic dental insert of claim 2, wherein the magnetostrictive element comprises a solid nickel rod.
- [c15] The ultrasonic dental insert of claim 2, wherein the magnetostrictive element comprises a plurality of nested coaxial tubes.
- [c16] The ultrasonic dental insert of claim 2, wherein the magnetostrictive element includes a volume of non-magnetostrictive material.
- [c17] The ultrasonic dental insert of claim 16, wherein the magnetostrictive element comprises a magnetostrictive particulate-filled polymeric monolith.
- [c18] The ultrasonic dental insert of claim 17, wherein the polymeric monolith is interlockingly molded to the velocity transducer.
- [c19] The ultrasonic dental insert of claim 18, wherein the polymeric monolith deforms at autoclave sterilization conditions.
- [c20] The ultrasonic dental insert of claim 19, wherein the polymeric monolith comprises acrylonitrile-butadiene-styrene copolymer.
- [c21] The ultrasonic dental insert of claim 17, wherein the polymeric monolith is interlockingly molded to a headpiece that is releasably attachable to the velocity transducer.

- [c22] An ultrasonic dental insert useful in a handpiece having an induction coil disposed about a well and operable with a power supply, comprising:
- a magnetostrictive element comprising a magnetostrictive particulate-filled polymeric monolith and adapted to be received in the well;
 - a velocity transducer having proximal and distal ends, wherein the proximal end is attached to a distal end of the magnetostrictive element;
 - a tip having a proximal end secured to the distal end of the velocity transducer.
- [c23] The ultrasonic dental insert of claim 22, wherein the polymeric monolith is interlockingly molded to the velocity transducer.
- [c24] The ultrasonic dental insert of claim 22, wherein the polymeric monolith deforms at autoclave sterilization conditions.
- [c25] The ultrasonic dental insert of claim 22, wherein the polymeric monolith comprises acrylonitrile-butadiene-styrene copolymer.
- [c26] The ultrasonic dental insert of claim 22, further comprising a sterile packaging.
- [c27] A method for adjusting power delivered to an ultrasonic dental insert in a handpiece having an induction coil disposed about a well and operable with an adjustable power supply having an adjustable power output setting ranging from a minimum to a maximum, wherein the insert comprises a power-sensitive tip having a power range, comprising:
- matching the tip with an efficiency-modulated magnetostrictive element to maintain the tip within its power range at the maximum power output setting,
 - coupling the tip to a velocity transducer operatively associated with the magnetostrictive element to form an insert assembly;
 - inserting the assembly in the well;
 - supplying power to the induction coil; and
 - adjusting the power output up to the maximum power output setting.